SINGLE-ROW TRAFFIC DIVIDER

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Inventor: CAMOMILLA GABRIELE (IT); BRUSCHI STEFANO (IT)
Applicant: AUTOSTRADE CONCESS CONST (IT); CAMOMILLA GABRIELE (IT); BRUSCHI STEFANO (IT)
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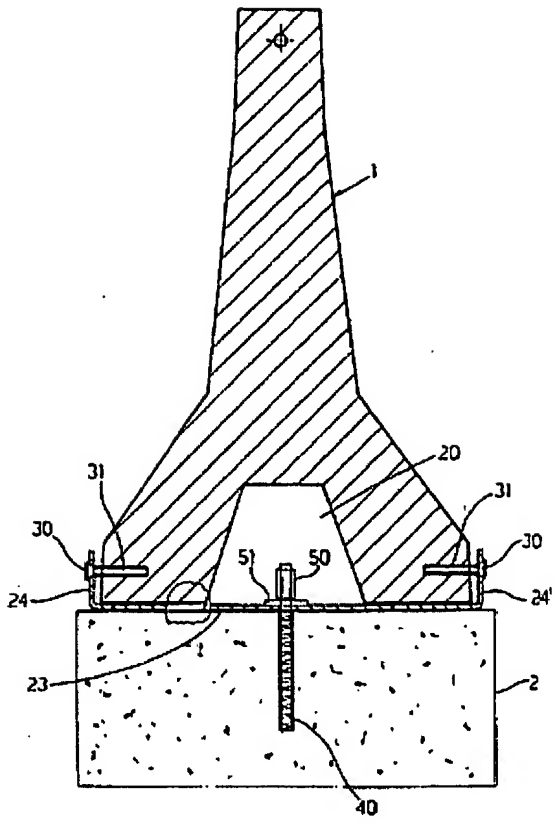
Abstract of WO9819015

Single-row barrier (1) made of concrete and used as a traffic divider comprising connections (23, 24, 30) between modules and anchor means (40) subject to predetermined breaking and fixed to the support (2) at the barrier foot.



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(71) Applicant *(for all designated States except US)*: AUTOSTRADE CONCESSIONI E COSTRUZIONI AUTOSTRADE S.P.A. [IT/IT]; Via A. Bergamini, 50, I–00159 Roma (IT).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: CAMOMILLA, Gabriele [IT/IT]; Via A. Bergamini, 50, I–00159 Roma (IT). BRUSCHI, Stefano [IT/IT]; Via A. Bergamini, 50, I–00159 Roma (IT).

(74) Agents: DOMENIGHETTI FIAMMENGHI, Delfina et al.; Fiammenghi Fiammenghi, Via Quattro Fontane, 31, I–00184 Roma (IT).

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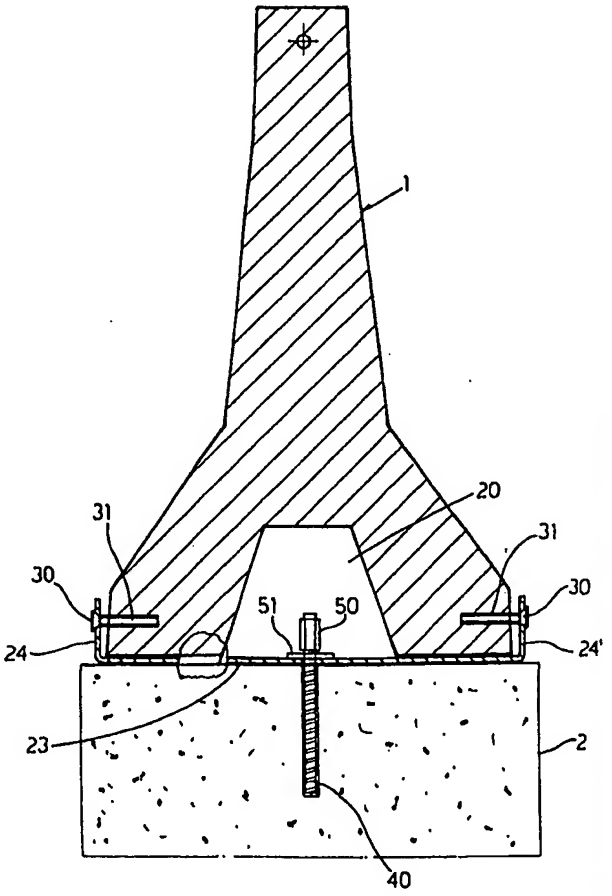
(57) Abstract

Single–row barrier (1) made of concrete and used as a traffic divider comprising connections (23, 24, 30) between modules and anchor means (40) subject to predetermined breaking and fixed to the support (2) at the barrier foot.



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Description

Single-row traffic divider

Technical field

The present invention relates to a New Jersey barrier forming a traffic divider made of concrete, and more particularly it relates to such a barrier having improved safety properties compared to barriers used nowadays.

Background art

It is known that the three fundamental prerequisites to which road barriers must conform, are the following:

a) they must absorb a predetermined impact energy;

b) they must prevent vehicles whose center of gravity is located at a height lower than a given value, from "jumping over" the barrier;

c) for cars, ASI $\leq$ 1, that is the decelerations must not be dangerous for the passengers.

Disclosure of invention

An object of the present invention is to realize New Jersey barriers made of concrete, constituting traffic dividers, included in the so-called class B3, according to which the energy thereshold is $\geq$ 600 kJ, the center of gravity of the vehicle may reach a height of H = 1.60 m without risk of "jumping over", and ASI $\leq$ 1, for cars up to 900 kg.

This class corresponds to a more restrictive regulation as compared to the prerequisites satisfied by barriers used before and belonging to the same category.

Another object of the present invention is to improve the connection between the various concrete modules which form the barrier, so as to increase the absorbed collision energy (homologation in the class B3) and reduce at the same time the lateral displacements.

Brief description of drawings

The present invetion will now be described for illustrative and non limitative purposes, with reference to the annexed schematic drawings, wherein:

Fig.1 is a cross secional view of the barrier along the line A-A of Fig.2, according to a first embodiment of the invention;

Fig.2 is a longitudinal cross sectional view, along line B-B of Fig.1;

Fig.3 is a cross sectional view of the barrier corresponding to Fig.1, wherein the cross section is taken however at the center of the module;

Fig.4 is a plan view of a first type of steel plate forming part of the connection device, for the junction heads between two adjacent barriers;

Fig.5 is a view of the plate of Fig.4 in the direction of the arrow C;

Fig.6 is a cross sectional view along line D-D of Fig.4;

Fig.7 is a plan view of a second type of steel plate to be mounted on the center of the module or in another position on the latter;

Fig.8 is a side view along the arrow E of Fig.7;

Fig.9 is a sectional view along the line F-F of Fig.7;

Fig.10 is a side view of a second embodiment of the barrier;

Fig.11 is a plan view of Fig.10;

Figs. 12a-12d are sectional views respectively taken along the lines G-G, H-H, and L-L of Fig. 10;

Fig.13 shows the horizontal section of the junction between two concrete modules, taken along the foot (toe) of the barrier;

Fig.14 is a plan view of the junction between two modules;

Fig.15 is a perspective view of a detail of the anchor system for connecting the barrier to the ground, pavement or curb;

Fig.16 is a cross sectional view of a barrier corresponding to a third possible embodiment, taken at a point distant from the upright of the handrail and from the anchor means, which are also part of the invention;

Fig.17 is a cross section similar to Fig.16, taken along the upright of the handrail;

Fig.18 is a cross section similar to Fig.17, before assembling of the handrail;

Figs. 19, 20 are views analogous to Figs. 16, 17, however with a different assembling system for the handrail;

Fig. 21 is a view along line N-N of Fig. 21.

Referring to Figs. 1 and 2 and to Figs. 4, 5, 6, number 1 denotes a concrete New Jersey barrier.

Modes for carrying out the invention

The barrier 1 is a traffic divider, that is it is interposed between two parallel carriageways.

The barrier 1 is supported by the curb 2 or directly by the pavement.

A plate of the first kind 3 is arranged below the barrier 1, in a recess provided according to the invention, on the lower surface of the modules 1', 1", in such a way that the lower surface of the plate 3 is flush (at the same level) with the remaining lower surface of the modules 1', 1", not covered by the plate 3. There follows that the barrier will not be "lifted" by the plates 3, and the friction coefficient between the barrier and the support 2, is that existing between concrete and the support 2.

The recess will be oversized compared to the plate 3, allowing an easy assembling of the plate of the first kind 3.

The lateral walls 4,4' of the plate 3 are received into the opposite lateral cavities or recesses 5, 5' provided on the modules 1', 1" of the barrier 1 at the junction 6.

As shown in Fig. 5, the lateral vertical walls 4,4' of the plate 3 of the first kind, have two holes 7a,7b, wherein the two opposite holes 7a are used to insert a cross bolt 8a, whereas the two opposite holes 7b of the plate 3, are used to insert a second cross bolt 8b. The bolt 8a passes through the end of the module 1", whereas the other bolt 8b passes through the other module 1'. The bolts 8a, 8b are introduced into through holes which already exist in the conventional barriers, but in the latter barriers the connection is effected by means of two separate lateral plates, whose role is now

played, according to the present invention, by the lateral walls 4,4' integral with the bottom 9 of the plate of the first kind 3. In this way the connection is more rigid and the play between the parts is reduced. Moreover, the plate 3 has two lateral extensions 10,10' which in this embodiment are rectangular and which are provided with slots 11, 11'.

As shown in the Figs. 1 and 2, through the slots 11, 11' vertical rods 12 are introduced which are embedded in the concrete of the curb 2 according to known methods (making use of a resin which can harden or of mortar). A washer 13 is put on the plate 3, on the slots 11, 11', and a nut 14 is screwed at the upper end of each vertical rod 12. However, these nuts 14 are left slack, that is they are not screwed tight against the washer 14 and the plate 3; this is done in order to ensure the correct operation of the barrier forming the traffic divider, as explained hereinafter.

When the vehicle collides with the barrier 1, the latter moves backwards, until the vertical rod 12 abuts on the edge of the slot 11 or 11', that is the plate 3; at this moment, the vertical rod 12 breaks under the shearing stress, after having absorbed a certain amount of energy, and the barrier may move further backwards.

The present invention therefore proposes to use a plate 3 which has several functions:

- anchoring to the curb or pavement by means of rods 12 (not provided for by conventional barriers);

- stiffening of the junction and elimination of the play, obtained by means of the bottom 9 of the plate 3 connecting the lateral walls 4,4'of the plate 3;
- "controlled" backward movement of the barrier at the junction region obtained by means of the vertical rods 12 with a predetermined impact failure.

As can be seen in Fig.3, the conventional concrete barrier has a central trapezoidal cavity 20 extending almost to the junction (see Fig. 2). This cavity 20 receives the nuts 14 of the vertical rods 12.

If the barriers are not laid on a concrete curb, but directly on the pavement or on the ground, the vertical rod 12, which may be longer in this case, must be inserted in a rigid device allowing however its impact failure under a shearing stress.

Figures 7, 8, 9 show a steel plate of the second kind 21. The steel plate of the second kind 21 has a central slot 22 on its bottom 23 and two lateral walls 24,24', each of them having a pair of holes 25a, 25b. It is also received in a recess on the lower surface of the barrier, as in the case of the plate of the first kind 3. The depth of the recess exceeds the thickness of the bottom 23.

This plate 21 is preferably assembled at the middle of a module of the barrier 1 and is used as an additional anchor means of the barrier (Fig.3).

Since concrete barriers 1 used nowadays as traffic dividers do not have any recesses 5,5' on the middle

portion of a module, the length l_2 of the plates of the second kind 21 is slightly greater than the distance l_1 between the lateral walls 4,4' of the plates of the first kind 3.

Four double expansion screw anchors 30 are introduced into the four holes 25a, 25b of the two vertical walls 24, 24' and in four horizontal holes 31 drilled in the module of the barrier 1. In a manner similar to the above procedure described for the case of the assembling of the plates of the first kind 3, a vertical anchor bar 40 is introduced into the central slot 22 of the plate of the second kind 21, and is embedded in the concrete of the curb 2. The nut 50 is screwed on the upper end of the vertical rod 40, but it is not screwed tight against the washer 51 which lays on the bottom 23 of the plate 21 of the second kind.

The operation is analogous to the previously described one. However in the present case the plate acts only as anchor means and therefore it is narrower, since it must not connect two separate modules to each other.

Also the bar 40 has a predetermined resistance against breaking caused by impacts.

If desired, two different plates of the second kind 21 may be mounted on the same module, each one at a distance of (6,20/3) metres from the corresponding junction.

It is obvious that the present embodiment of the invention can be realized with few changes in the

existing barriers, and notwithstanding this fact, it allows an adaptation to the new body of rules, which specify high containment energies, but reduced displacement during the collision (crash) test.

Obviously, concrete barriers could be made in the future in such a way to include recesses 5 also in the middle portion of a modular element or in other regions away from its ends, in order to receive the lateral walls of a plate of the second kind, having however a length $l_1 < l_2$, wherein $(l_2 - l_1)/2$ is substantially equal to the recess depth.

This embodiment of the invention may be realized in different technically equivalent forms, all falling within the same inventive concept.

In particular, the shape and thickness of the plates, the length of the vertical rods and their arrangement, shape of the slots and their arrangement, a.s.o., are parameters which vary according to the application.

With reference to Figs. 10-15, a second embodiment of the invention is described.

The barrier consists of different modules 1''', like the one shown in figs. 10 and 11, comprising a male head 60' and a female head 60. According to the invention , this barrier is not formed with an inner trapezoidal cavity, but it is solid (see Figs. 12a to 12d) and has a specific weight > 2,7 kg/dm(3). Moreover, its height is $\geq$ 1 m, and preferably it varies between 1 m and 1,05 m. The increased weight of the barrier produces shorter

lateral displacements during the collision, due to friction between the concrete and, for instance, the bituminous conglomerate.

As shown in Fig. 12b, which is a cross section along line H-H of Fig. 10, there are provided recesses 62 at the foot (toe) of the barrier, which are alternately formed on one or the other side of the module 1'''. In each recess 62 is mounted an anchor system like the one shown in Fig.15, formed by a steel box-like element 63, comprising an upper plate portion 64 and a lower plate portion 65.

The lines 66,66'are the steel reinforcements of the concrete material forming the module 1''', at the recess region 62. Vertical rods with a helical end are introduced into the ground or in a previously realized bore obtained in the bituminous conglomerate of the support 2, in case the latter is made of a bituminous conglomerate.

The helical end allows a stable connection to the ground or the bituminous mix, in general to the support 2; moreover, these vertical rods (not shown) are provided at their upper end with a nut which will be received in the box-like element 63, which is arranged in the recess 62. The nut will be located at the center of the box 63, and the barrier will be allowed to move almost freely (some centimetres) backwards, during the impact, before the nut abuts the walls of the box 63, thereby permitting energy absorption by the vertical rod (whose

function is the same as that of the bars 12) and its subsequent possible breaking caused by the shearing stress. The way the vertical bar is anchored to the support 2 may be of any kind known to a skilled person. For instance, it is possible to employ a resin contained inside a cartridge, so that when the latter breaks the resin can harden; etc.

As shown in Fig. 12a, at the junction between the two heads, separate vertical plates 70,70'are employed, as for the case of conventional barriers, that is, no single plate 3 connecting them is provided, as in the first embodiment. However, also in this second embodiment, it could be possible to use the plates 3.

Referring to Figs. 10,11,12c, 12d, it can be noted that the horizontal bar 71, diwidag, montesi or the like, projecting with both threaded ends 72 from the concrete module 1''', may be bent more easily compared to conventional bars, at said ends 72, since near the latter ends the bar can laterally move inside the coaxial holes or seats 73 which have an oversize diameter compared to that of the bar 71 (see also Fig. 12c).

Therefore, when both threaded ends 72 of the male-female heads of the modules 1''' must be connected by means of a screw coupling, the connection can be realized also when the two modules 1'''are not perfectly aligned. This feature ensures that the assembling is realized accurately.

Fig. 14 shows how the connection is performed using a screw coupling 74.

In the present embodiment, bars 71 having a diameter of about 28 mm are employed, which is greater than that of conventional bars of this kind.

Referring to Figs. 16-18, an embodiment is shown, which employs a handrail fixed by means of montesi bars or the like 85. In this case too, the barrier has no central trapezoidal cavity, that is it is solid. The specific weight is > 2.7 kg/dm(3). The barrier height is in this case approximately equal to 1m, and that of the handrail can be 35 cm, for example. The handrail 80 is provided for the purpose of preventing a vehicle with a center of gravity located at a height of 1,60 m, from "getting over" the barrier.

Figs. 19-21 show an alternative way of fixing the handrail.

In Fig. 17, a montesi bar is introduced in the hole 90 shown in Fig. 18.

Claims

1. Single-row concrete New Jersey barrier used as a traffic divider, whose single modules (1',1",1''') are connected by vertical steel plates (4,4' and 70,70') and cross bolts (8a,8b) passing through the corresponding male and female junction heads of the modules (1',1",1'''), characterized in that anchor means are provided in order to rigidly connect the barrier to its support, in the form of vertical bars allowing a partially free backward motion of the barrier and an impact energy absorption, and breaking under a shearing stress when impact energy exceeds a certain predetermined value.

2. Single-row barrier according to claim 1, characterized in that said vertical steel plates (4,4')are integral with a plate bottom (9) extending below both male-female heads of two contiguos modules (1,1').

3. Single-row barrier according to claim 2, characterized in that said bottom (9) is received in a recess provided on the lower surface of the barrier, in the region of the junction between the two heads, so as to be flush with the remaining lower surface of the concrete made barrier.

4. Single-row barrier according to claim 1 and 3, characterized in that in extensions (10,10') of the bottom (9) slots (11,11') are provided wherein vertical anchor bars (12) are introduced, said bars breaking under a predetermined impact energy and the head (50) of said vertical bars (12) protruding inside the longitudinal trapezoidal cavity (20) of the barrier.

5. Single-row barrier according to claim 1, characterized in that in some intermediate positions between the junction heads of each modular element (1',1"), C-shaped plates (21) are mounted whose bottom (23) has a slot (22) to allow the passage of a vertical anchor bar (40) for fixing to the barrier support, said anchor bar (40) breaking under a predetermined impact energy, whereas the vertical walls (24,24') of the C-shaped plates (21) are connected to the concrete material of the barrier (1) by means of double expansion screw anchors or other fixing means.

6. Single-row barrier according to claim 5, characterized in that the bottom (23) of said C-shaped plate (21) is received in a recess provided on the lower surface of the barrier, at the junction region between both junction heads, in such a way that the lower surface of the C-shaped steel plate (21) is flush or located at a slightly higher level compared to the remaining lower surface of the barrier, which is made of

concrete.

7. Single-row barrier used as a traffic divider and made of concrete according to claims 4,5,6, characterized in that the anchor bars (12;40) are embedded in the concrete of the support (2) or inserted in a rigid device introduced in the support (2) in order to allow, in any case, the breaking under a shearing stress of the bars (12;40).

8. Single-row barrier used as a traffic divider according to claim 1, characterized in that it is formed by a body which is solid, that is without cavities having a trapezoidal section, and in that it has a specific weight >2.7kg/dm(3), a height up to 1.05 m, and housings (63) to receive the anchor means, arranged at the foot or toe of the barrier, preferably at both sides of the same.

9. Single-row barrier according to claim 8, characterized in that said housings (63) receiving the anchor means, are boxes mounted inside recesses or cavities (62) at the foot or toe of the barrier, and in that the head of the anchor means which form vertical bars, is located centrally inside a box(63), in order to allow an almost free movement of the barrier, until the wall of the box (23), after the impact, causes breaking of the anchor bar head under the shearing stress.

10. Single-row barrier according to claims 8 and 9, characterized in that it comprises a handrail (80) which is connected to the upper end of the barrier by known means.

11. Single-row barrier according to claims 8,9,10, characterized in that the height of the handrail (80) preferably does not exceed 35 cm.

12. Single-row barrier according to any of the preceding claims, characterized in that the longitudinal bar (71) which is incorporated in the upper region of the concrete module (1'''), can be freely bent at its ends (72) in order to facilitate the connection to other modular elements (1'''), this being allowed by providing holes (73) coaxial with the bar (71) at the ends of the modular element, so as to permit small transverse displacements of the bar (71) inside said holes (73).

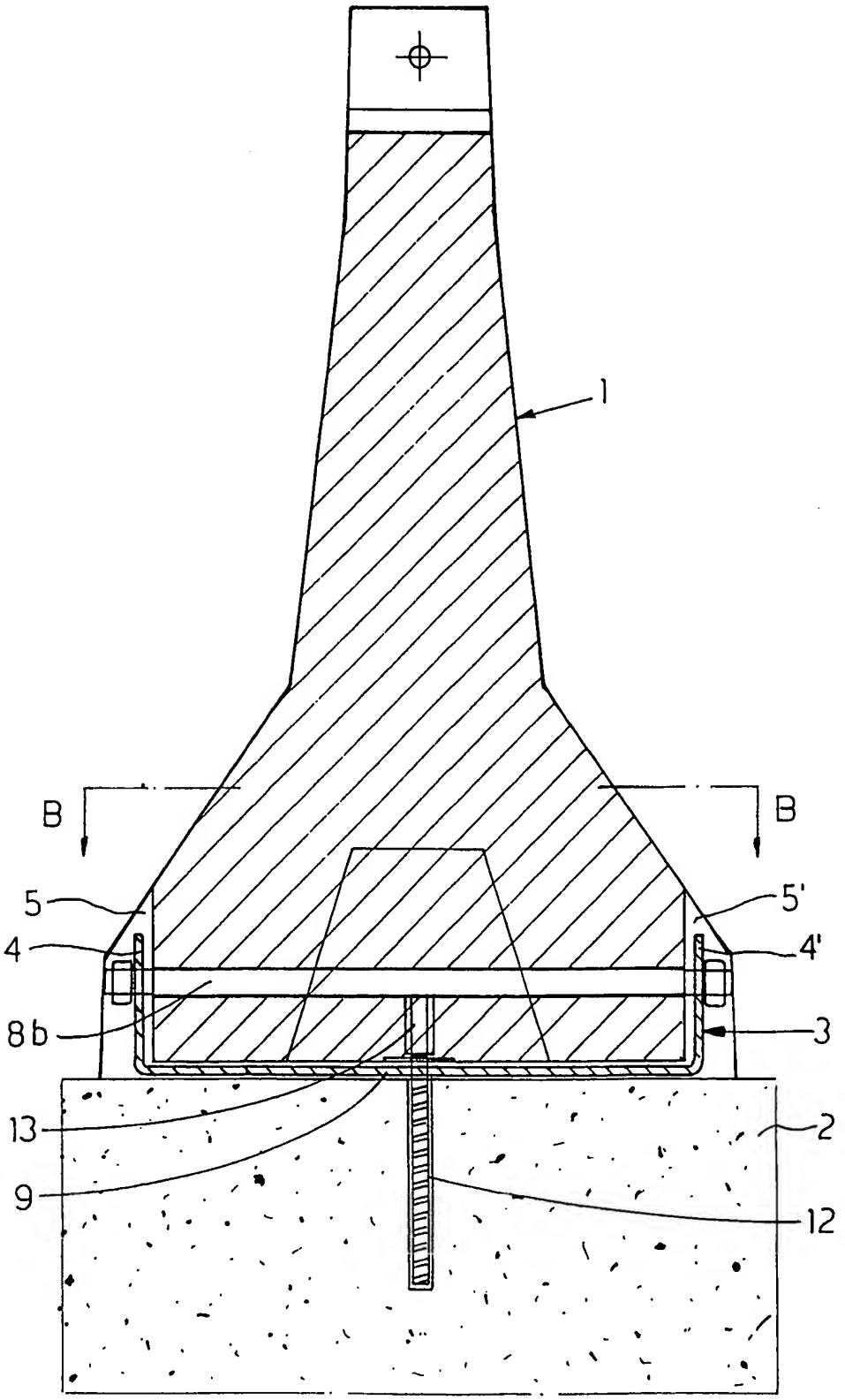

FIG. 1

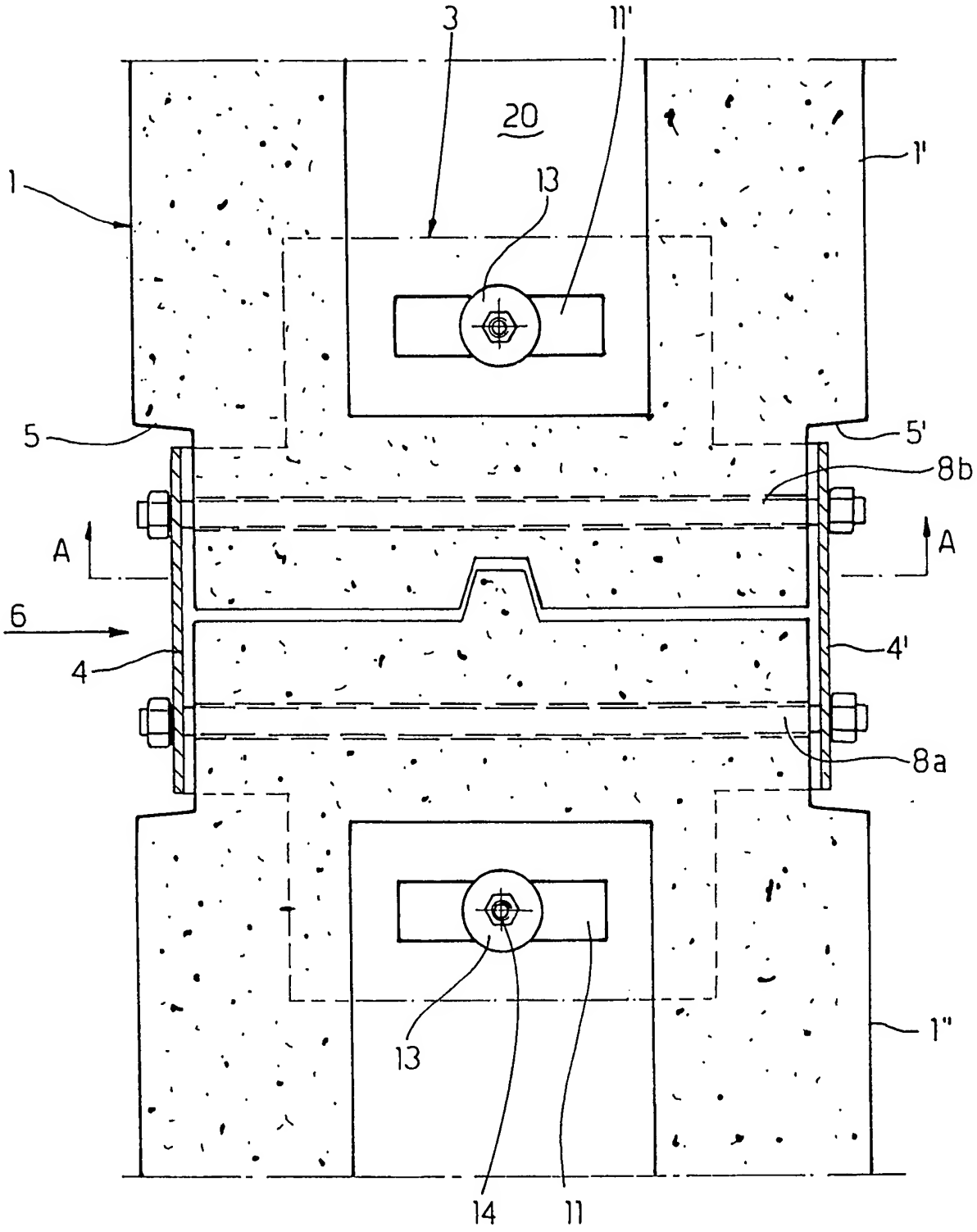

FIG. 2

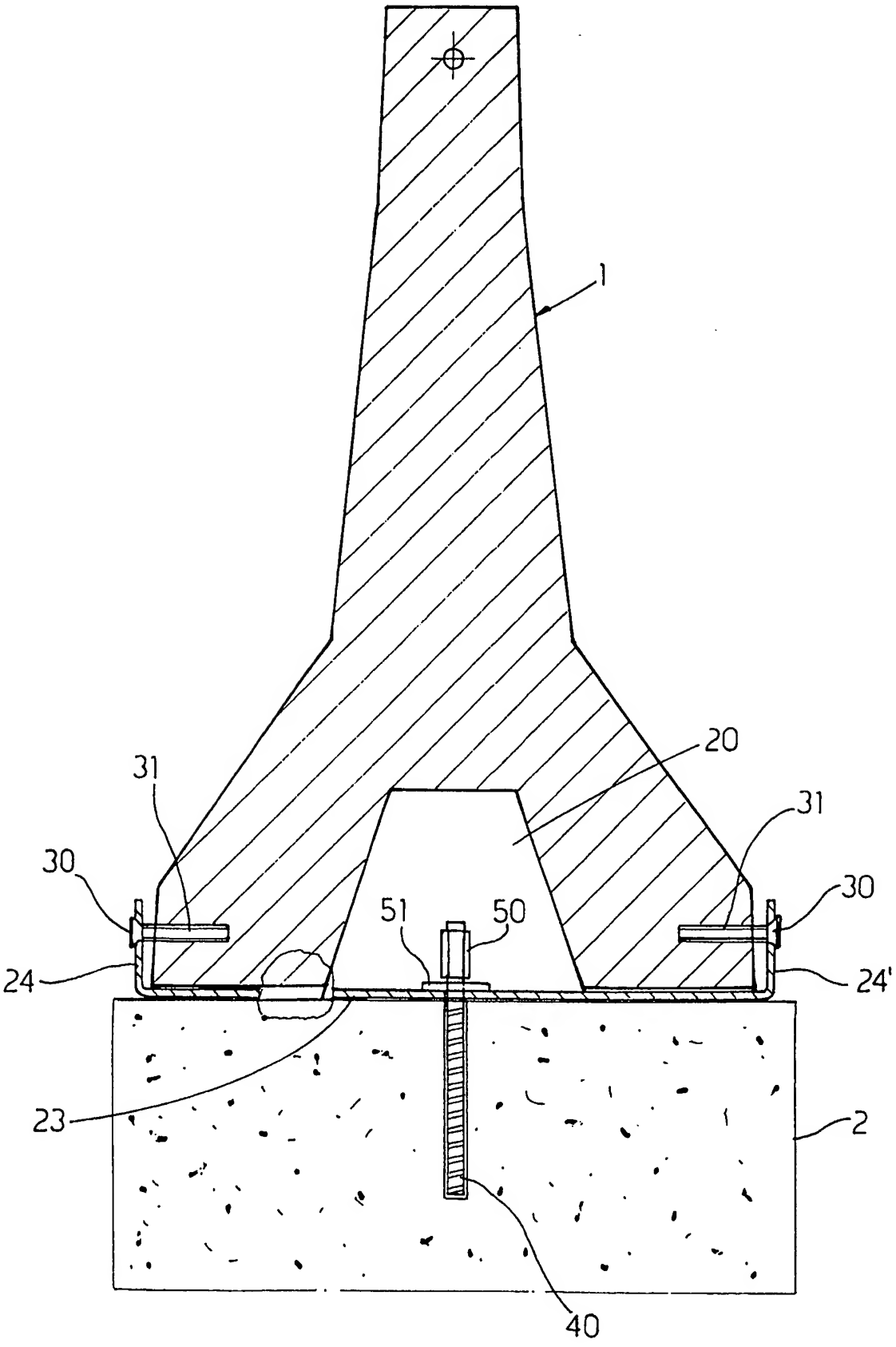

FIG. 3

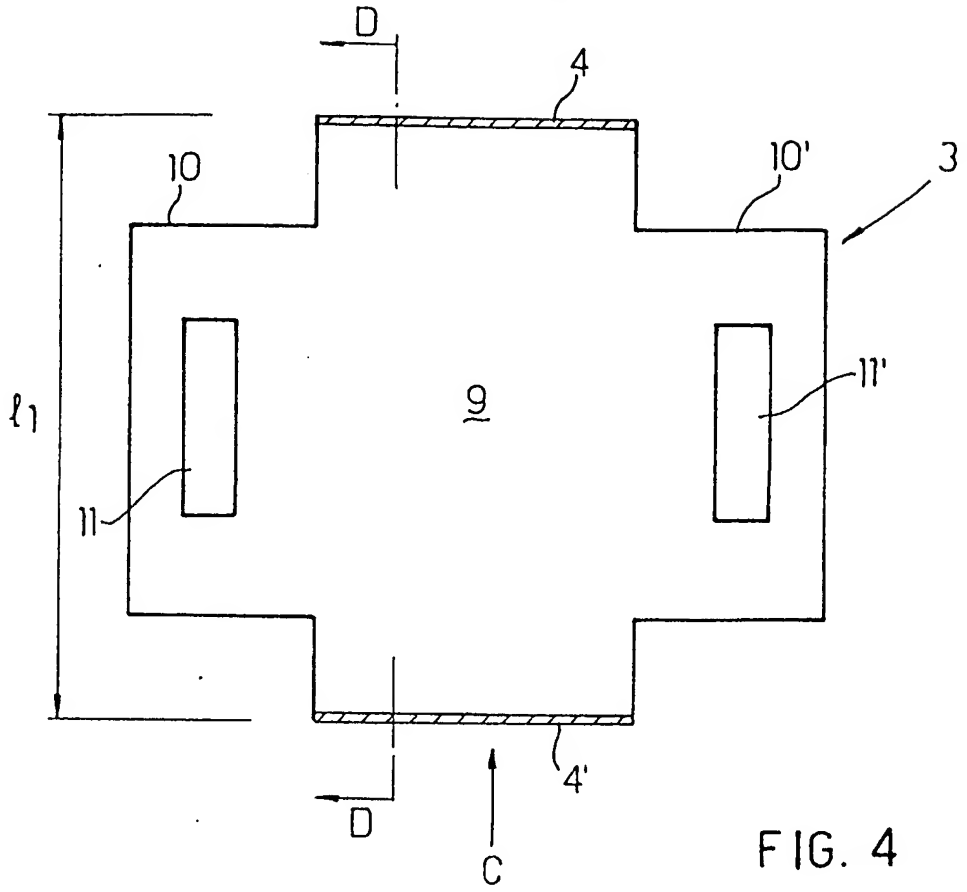

FIG. 4

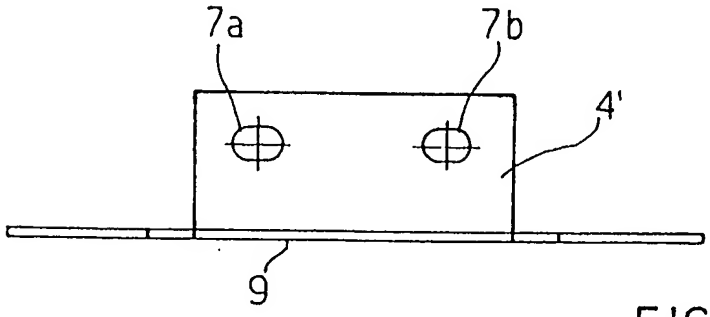

FIG. 5

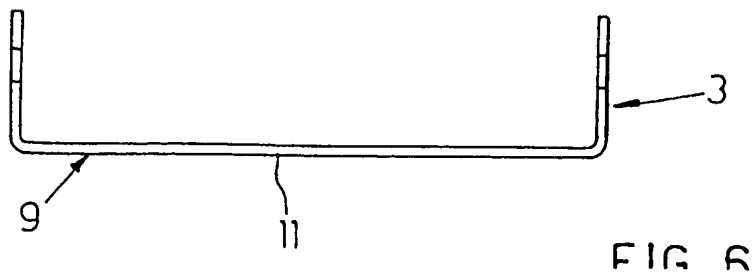

FIG. 6

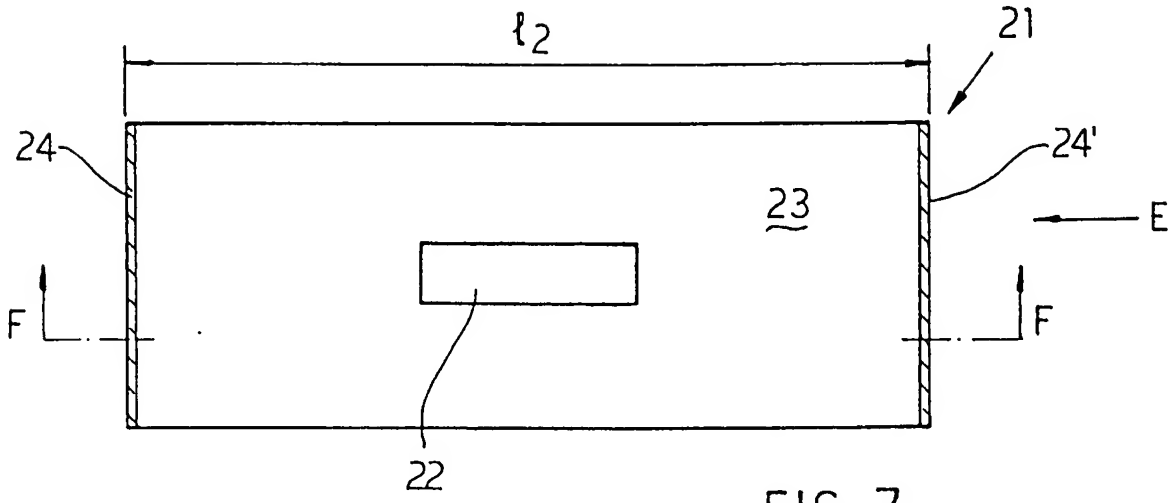

FIG. 7

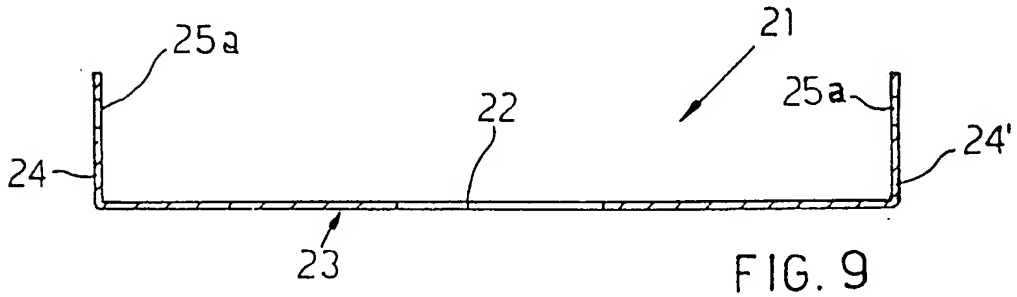

FIG. 9

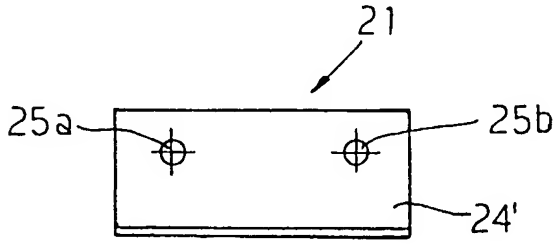

FIG. 8

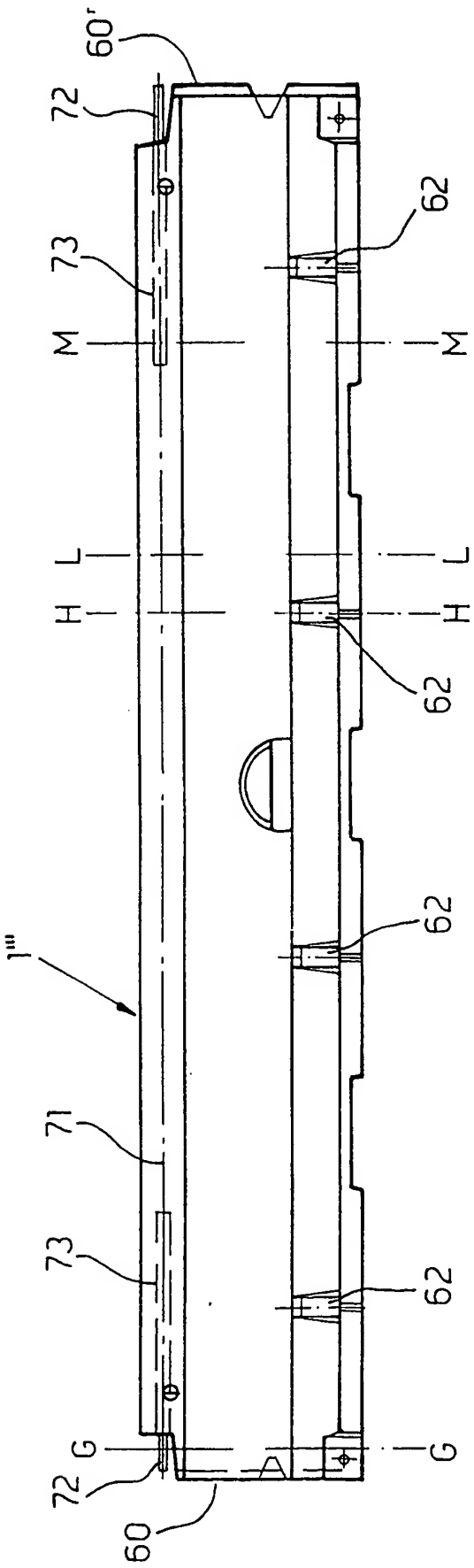

FIG. 10

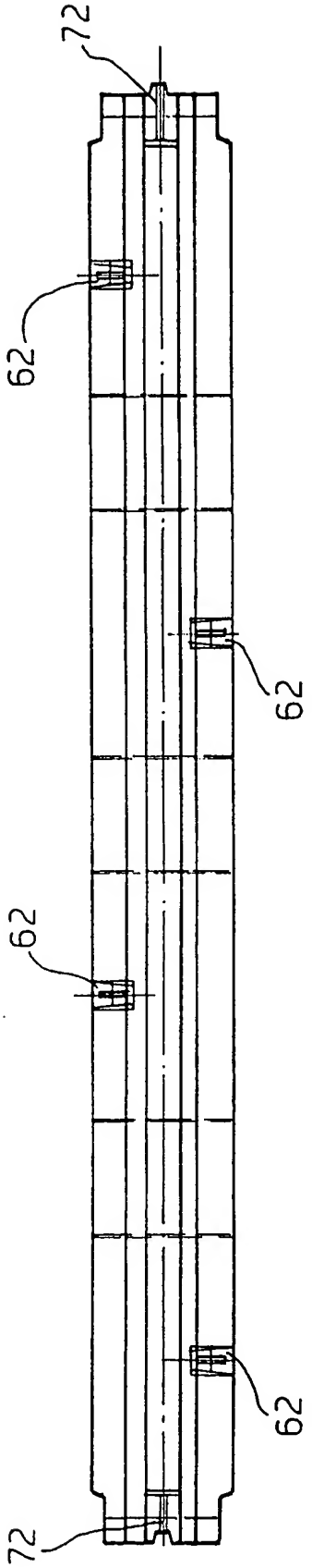

FIG. 11

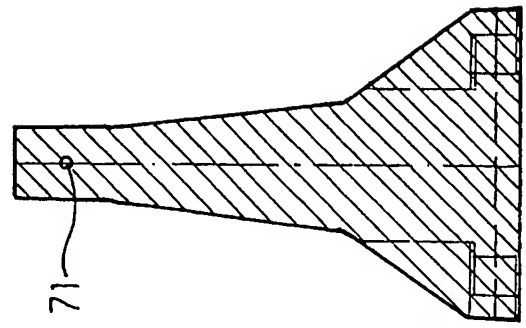

FIG. 12d

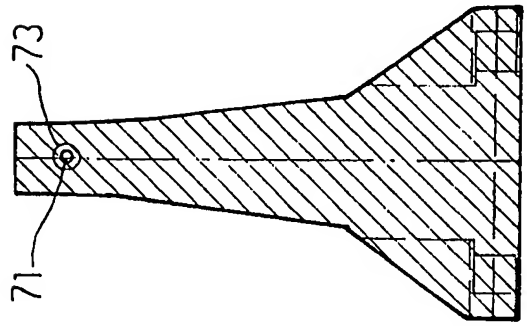

FIG. 12c

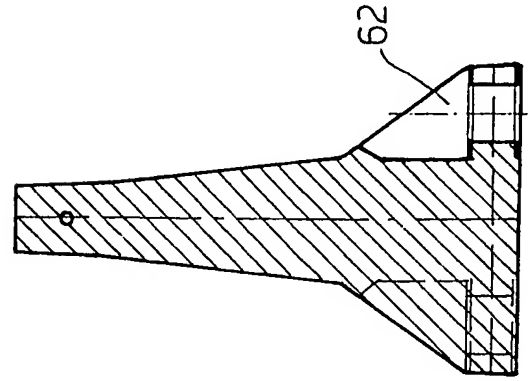

FIG. 12b

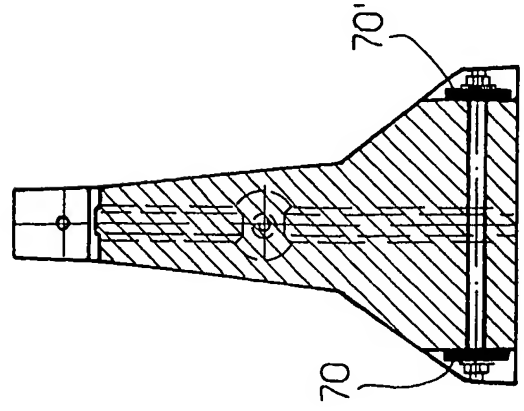

FIG. 12a

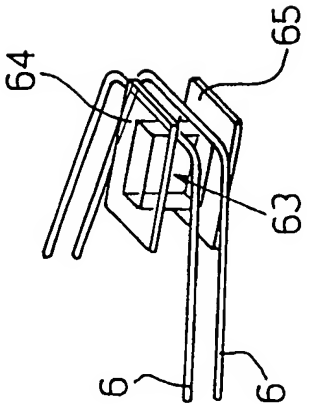

FIG. 15

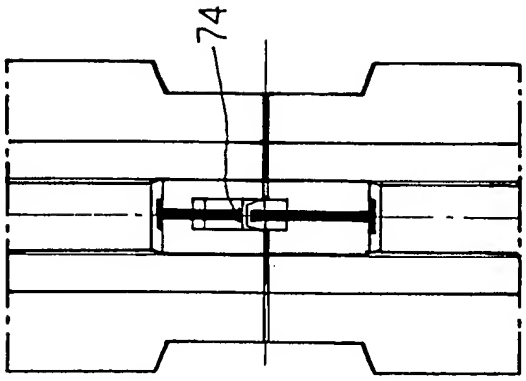

FIG. 14

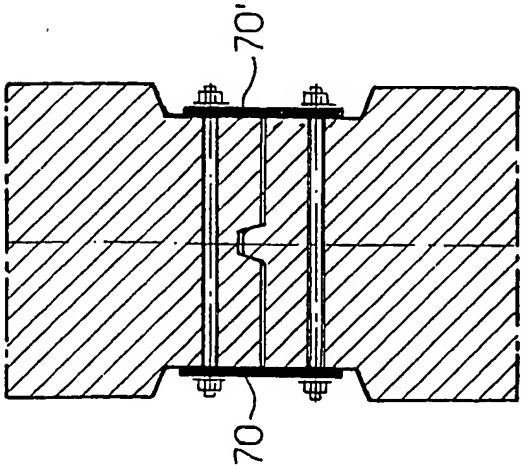

FIG. 13

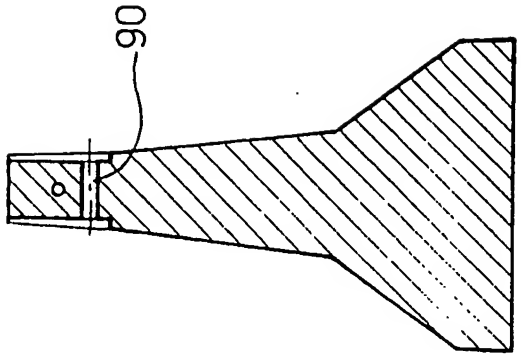

FIG.18

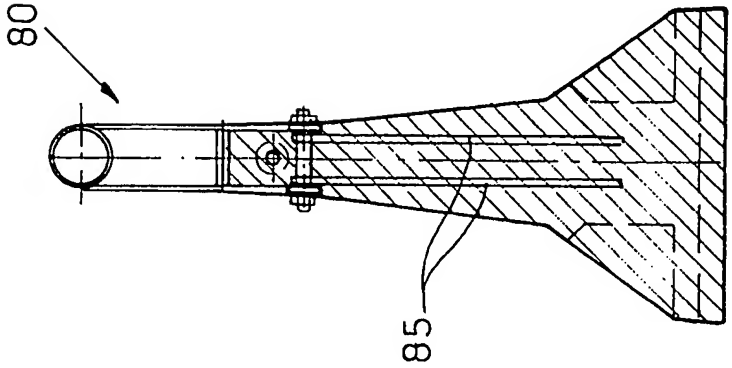

FIG. 17

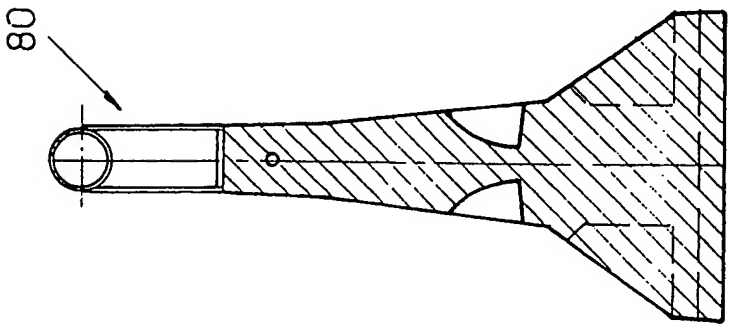

FIG. 16

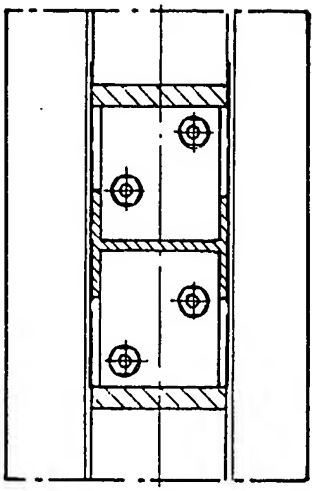

FIG. 21

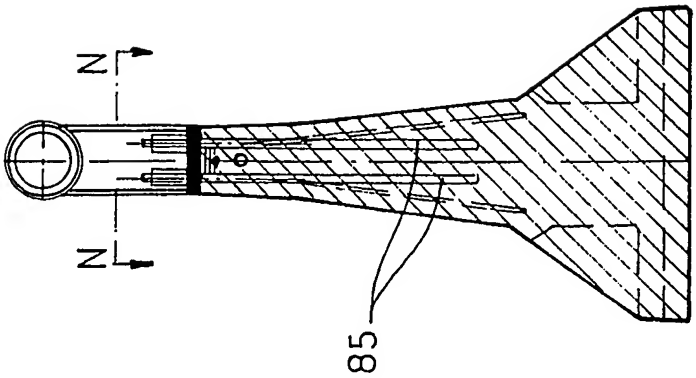

FIG. 20

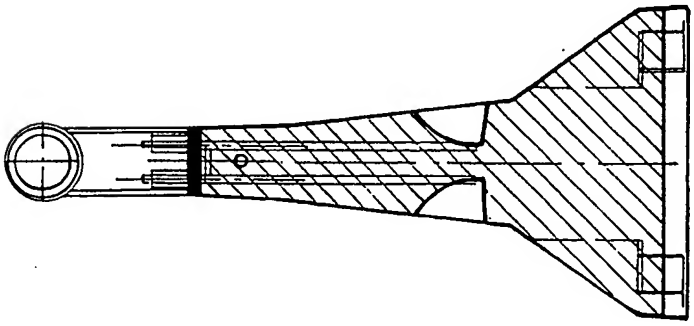

FIG. 19

INTERNATIONAL SEARCH REPORT

Int. ional Application No
PCT/IT 97/00196

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E01F15/08

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 E01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 459 932 A (A. GARCIA BALLESTEROS) 4 December 1991 see column 4, line 6 - line 20; figure 6 ---	1
A	DE 296 06 934 U (Z. SPACEK) 14 August 1996 see page 10, line 15 - page 11, line 6; figure 7 ---	1
A	US 4 844 652 A (B. SCHROUGHAN) 4 July 1989 ---	
A	US 4 502 812 A (S. ZUCKER) 5 March 1985 -----	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

3

Date of the actual completion of the international search	Date of mailing of the international search report
20 November 1997	28/11/1997

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040. Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Verveer, D

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. ional Application No
PCT/IT 97/00196

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 459932 A	04-12-91	AT 134405 T	15-03-96
		DE 69117214 D	28-03-96
		DE 69117214 T	02-10-96
DE 29606934 U	14-08-96	FR 2733259 A	25-10-96
US 4844652 A	04-07-89	NONE	
US 4502812 A	05-03-85	NONE	